MASTER OF SCIENCE
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SIMULATION OF AN ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING BASED UNDERWATER COMMUNICATION SYSTEM USING A PHYSICS BASED MODEL FOR THE UNDERWATER ACOUSTIC SOUND CHANNEL

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The primary thrust of this thesis is the development of a computer-based simulation of an Orthogonal Frequency Division Multipexing (OFDM) based underwater acoustic communication system. The product will support the testing and evaluation of various digital signal processing algorithms applicable to underwater acoustic communication systems using OFDM as well as the study of the effects of the acoustic channel and communication system factors on the key parameters of the system such as bit error rate, received signal to noise ratio, frequency band of employment and overall system bit rate. The underwater acoustic sound channel is modeled using a physics based parabolic equation approximation. The simulation models the key components in the transmitter and receiver that contribute to the overall performance of the system. The results of the thesis provide expected values for system performance in terms of bit rate, bit error rate and received SNR for given frequency bands and are validated through comparison to theoretically derived expectations and to ocean testing of OFDM underwater communication systems.